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This 1998 305(b) report is the result of the combined efforts and cooperation of various Department of Environmental Quality (DEQ) programs and programs in other state agencies, as well as input and assistance from various public and private organizations. The primary information for nonpoint source assessment was collected and analyzed by the Department of Conservation and Recreation (DCR). Other water quality, health related information, was provided by the Virginia Department of Health (VDH).

The overall water quality assessments for the individual waterbody basins was conducted by the water quality planning staff in each of the DEQ regional offices. The regional ambient monitoring program staff collected and provided the primary, quality assured data used by the regional planning coordinators in their overall evaluation of water quality within each basin located within the regional boundary. The Virginia Division of Consolidated Laboratory Services (VDCLS) analyzed the ambient station samples and provided the results to the regional office for inclusion into the water quality database. Additional fish tissue and sediment samples were collected by the DEQ Standards and Research program. Analysis of these samples are provided by the College of William and Mary/Virginia Institute of Marine Sciences and the results are also incorporated into the overall basin assessments. The DEQ Chesapeake Bay program provided sampling data which was incorporated into the overall coastal and estuary assessment. The DEQ Wetland and Groundwater programs provided valuable insight into each programs impact on water quality issues, while the DEQ Construction Assistance program provided cost/benefit analysis information. The DEQ Water Quality Assessment staff at the central office assisted with much of the final preparation and review of the contents of this report as well as production of the report cover.

Many other sources provided information used in the overall assessment of water quality in Virginia. These contributors include local governments, regional agencies and various citizen groups interested in water quality issues. Information provided by the DEQ Pollution Prevention program has assisted numerous public, private and industrial organizations with pollution prevention techniques and incentives for pollution reduction which ultimately results in improved water quality.

Finally, specific monitoring data and other summary and/or procedural information was provided by several federal programs. These include the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service and several sections within the Environmental Protection Agency.

It is with my greatest sincerity that I acknowledge the appreciation each contributor deserves for their assistance in preparation of this report. Without your assistance, this 305(b) water quality assessment report could not have been completed.

My thanks to all contributors,

Harry H. Augustine, III
Virginia 305(b) Coordinator

INTRODUCTION

The 1998 Virginia Water Quality Assessment Report is a summary of the water quality conditions in Virginia during the past five years (July 1, 1992 - June 30, 1997). This report is submitted to the Environmental Protection Agency and Congress to satisfy the federal reporting requirements under Section 305(b) of the Clean Water Act.

Summary information on water quality and the programs developed by the Department and other state agencies to assess and protect water quality and human health have been incorporated in this report. Detailed information on the nine river basins found in Virginia are not presented in this report. This information, however, is maintained for each watershed in a computerized database at DEQ. Specific information can be retrieved upon request by contacting the DEQ's central or local regional office.

Several "structural" modifications have been made to this report in an attempt to make it easier to understand by providing specific summary information about the water quality assessment programs and the subsequent quality of the waters assessed.

Along with the structural modifications to the report, several aspects of the assessment process have changed from previous assessments. First and foremost, the overall assessment of water quality has gone to a five year period. Previous assessments were based on a two year period which made it difficult to accurately predict water quality because the number of sampling data points available were limited. By going to a five year assessment period, more data points are available and a better statistical analysis of the data can be performed. Secondly, the use of the "fully supporting but threatened" category has been modified and greatly increased to include Department of Conservation and Recreation (DCR) "high ranking" watersheds, DEQ designated "nutrient enriched waters" (9VAC 25-260-350) and shellfish waters with temporary harvesting restrictions. Due to the many judgmental assessment factors involved with the threatened category, three subcategories of fully supporting but threatened waters, each having a ranking priority, are being developed. One of the main benefits from this approach will be the ability to "focus" the monitoring program into these threatened waters using the priority ranking process. Finally, EPA and state guidance for the delineation of assessed stream miles has provided a more consistent method to determine the number of stream miles associated with each ambient sampling station. Generally, the mileages associated with each monitoring station and the data collected have been reduced, thus reducing the total miles of monitored waters.

The structural and procedural modifications previously noted, result in an increased number of samples required for assessement purposes, a minimum of 13. This means newly created sampling stations which collect quarterly data may not have sufficient data to make an assessment. In these cases, the assessment is classified as "reserve judgement" due to insufficient data unless preliminary data indicates water quality problems, where the threatened category could be appropriate. This reserve judgement category is not included in the total miles assessed as a final assessment is pending, due to the need for additional data. As a result, this new assessment procedure results in a reduction in total miles assessed but does not mean that monitoring has decreased.

In addition to the previously described changes in 1998 water quality assessment process, the 305(b)/303(d) guidance manual has been revised and updated in an attempt to enhance assessment quality and consistency among the regional offices. The revised manual is currently being reviewed by an academic advisory committee (AAC) made up of academic advisors from several state universities who are familiar with water quality issues. The purpose of this committee is to review the procedures associated with water quality assessment and provide comments back to DEQ concerning any technical issues the committee feels may need additional revision or clarification. DEQ has also made this guidance document available to the public for comment and additional revisions from this review process may be necessary.

In July 1997 the Department established the Water Quality Monitoring Task Force. The purpose

of the Task Force is to update the water quality monitoring program to conform with the monitoring requirements of the Water Quality Monitoring, Information, and Restoration Act of 1997. The Task Force has analyzed the current operational plans of the various monitoring programs within the Department and has begun implementation of a two year project to revise the overall monitoring strategy. The expected outcome of this effort will be more consistent station siting, greater stream mile coverage, and expanded pollutant analyses so the overall water quality can be determined within specific and easily identifiable, geographically defined water segments.

To accomplish the goal of increasing the number of stream miles monitored, the Department's newly established volunteer monitoring program has begun the role of coordinating the monitoring activities of participating volunteer groups. Consistent quality control practices and quality assurance procedures within the volunteer monitoring programs will ensure the creditability and precision of the volunteer data for use in the "monitored data" assessment process.

Alternative station siting selection criteria are being explored as a basis for expanding river miles monitored. Historical monitoring station selection is being used to determine any need for additional monitoring in those waters known to have water quality problems.

Expanded pollutant analysis is currently being conducted by using new techniques developed by the Department. These include clean metals monitoring, additional pathogenic bacteria monitoring, and pilot projects for trace organics in whole water column analyses.

The pending results of the long term water quality trend analysis being conducted by Virginia Polytechnic Institute and State University (VPI&SU) should provide additional insight for the monitoring program Task Force and will likely affect future monitoring site location, coverage, and parameter selection.

Another evolving aspect of the 1998 water quality assessment involves the expanded sampling and analysis for a relatively unknown microorganism ***Pfiesteria piscicida.*** This microorganism has been linked to extensive fish kills in North Carolina estuaries. Leading experts from North Carolina State University and the Florida Department of Environmental Protection have not identified the toxic microbe in samples from Virginia. However, *Pfiesteria piscicida* was found in several Maryland rivers with fish kills during the summer of 1997. Since data associated with this sampling program have only begun to be collected, the actual water quality impacts are still being reviewed. Therefore, the Department has reserved judgement on water quality issues associated with *Pfiesteria*. Additional information is provided in Chapter 2.5 of this report.

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Chapter 1.1 EXECUTIVE SUMMARY

The 1998 305(b) Water Quality Assessment Report describes the water quality conditions in the Commonwealth of Virginia during the time period beginning July 1, 1992 through June 30, 1997. The primary purpose of this report is to satisfy the Department of Environmental Quality's (DEQ) federal water quality reporting requirements under Sections 305(b), 106, 314 and 319 of the Federal Clean Water Act. It also serves to supplement the water quality assessment requirements associated with Virginia Senate Bill §1122 (Water Quality Monitoring, Information and Restoration Act).

Virginia has nine major river basins with an estimated 49,350 miles of perennial rivers and streams and approximately 2,500 square miles of estuaries. These figures were calculated utilizing the Environmental Protection Agency (EPA) River Reach File Version 3 (RF3).

Virginia's overall water quality is assessed based on the ability of the citizens to safely enjoy the designated uses of the waters as described in the DEQ water quality standards. Table 1.1-1 briefly describes the designated uses and the baseline criteria used to support the designated uses.

Table 1.1-1 DESIGNATED USE MATRIX

NO.	DESIGNATED USE	SUPPORT OF USE DEMONSTRATED BY
1	Aquatic Life Use	Conventional Pollutants (DO, pH, Temp.); Toxic contaminants in water column; Toxic contaminants found in fish tissue and sediments; Biological evaluation.
2	Fish Consumption Use	Advisories and restrictions issued by VDH.
3	Shellfish Consumption Use	Restrictive actions for harvesting and marketing of shellfish resources made by Div. of Shellfish Sanitation of VDH.
4	Swimming Use	Conventional Pollutant (Fecal Coliform Bacteria) and/or beach closures issued by VDH
5	Public Water Supply Use	Closures or advisories by VDH.

Surface Water Quality

The assessment of surface waters and their ability to support the designated use(s) is based on two different categories of water quality information: **monitored data** and **evaluated data**. "Monitored" data comes primarily, from monitoring station samples DEQ has collected, analyzed and stored in the Environmental Protection Agency's (EPA) STORET database. This data includes the analysis of conventional and toxic water column samples, fish tissue samples, sediment samples and biological assays. Where monitoring data are not available, an "evaluation" is made, wherever possible, of the attainment of the individual uses found in the water quality standards. These evaluations are based on data associated with land use, point source discharges, nonpoint source pollution potential, fishery information, staff knowledge, and any other relevant water quality information.

The number of monitoring stations providing sampling data during the five year period was 1,620 stations. In previous years, most monitoring stations in Virginia were established to document known or suspected discharge problems or "targeted" monitoring for point source dischargers. The result of this station siting method was to "focus" on known water quality problem areas. Recently, DEQ has become increasingly aware of potential, unknown, nonpoint source water quality contamination and has moved some point source targeted stations to include random stations in seemingly non impacted areas. The intent of this change in monitoring strategy is to produce a more accurate and balanced portrayal of the

state's overall water quality conditions and attempt to better understand the impacts associated with various point source and nonpoint source influences.

This report presents the results of the assessment of water quality in approximately 19,260 miles (39.0%) of the total 49,350 miles of free flowing streams and rivers. The overall goal of the assessment program is to identify problem waters and to design and implement a water quality management plan to return the waters to their designated uses as described in the water quality standards. Of the river miles assessed, 8,587, (44.6%) fully support all assessed uses, 8,062 (41.9%) fully support all assessed uses but are threatened for at least one use, and 2,605 (13.5%) are impaired for one or more uses.

As in previous reports, the "fully supporting but threatened" category has been used. This category is used to describe a particular designated use that fully supports that use now but, based on evaluated or other related data, especially those associated with nonpoint source impacts, may not in the future. For the 305(b) report, Virginia uses this category to describe waters designated as “nutrient enriched” and nonpoint source “high priority” waters as well as waters where water quality standards have not had enough violations or data ponts to be listed as impaired using the binomial assessment method (as described in Chapter 3.2). As part of the ongoing assessment process, these threatened waters will assist the monitoring program in station siting and better, more conclusive, assessment data should be the result.

In general, fecal coliform bacteria exceedances are the leading cause of non or partial support of designated uses in rivers and streams. Agricultural practices appear to be one of the primary sources causing the loss of designated use support. Indications are present that uncontrolled agricultural and pasture land use results in much of the fecal coliform bacteria and nutrient contamination in Virginia's waters. However, urban runoff, as well as municipal and industrial dischargers, are also significant contributing sources. Impaired waters due to naturally occurring conditions are also included in the 305(b) report.

Designated uses were determined to be fully supporting for 623 square miles (25.8) of the 2418 square miles of Virginia's estuarine waters assessed for this report. Fully supporting but threatened accounts for 1,359 square miles (56.2%) and 437 square miles (18.1%) were assessed as impaired for one or more uses. The primary causes of impairment in Virginia's estuarine waters were benthic impairments primarily due to naturally occuring low dissolved oxygen events and fecal coliform bacteria associated with shellfish consumption advisories. The primary sources of impairment are VDH shellfish advisories and low dissolved oxygen events which occur during warmer weather especially in the deeper waters.

Based on available information, all of Virginia's 120 miles of the Atlantic Ocean Coastal Waters were evaluated as fully supporting Virginia's designated uses.

Public Health/Aquatic Life Concerns

Increasingly, DEQ is addressing the role toxic pollutants play in reducing water quality. DEQ supports programs to monitor, evaluate, and alleviate toxic impact on aquatic life and human health. This report describes programs, now in place, that address toxicity in state waters. DEQ has increased the number of stations within the Ambient Water Quality Monitoring (AWQM) network where water column and sediment samples are collected for toxics analysis.

The Virginia Department of Health (VDH), Bureau of Toxic Substances has established five health advisories and one restriction currently in effect for fish consumption on 235 miles of the Commonwealth's streams and waterways and on approximately and 222 (tidal river) estuary square miles in the James River. The remaining advisories/bans are as follows:

- 80 miles of the North Fork Holston River are restricted to catch-and-release fishing due to mercury pollution.

- 103 miles of the South River and S.F. Shenandoah River are under a fish consumption restriction due to mercury pollution. VDH advises that no more than one meal per week of fish from these waters be consumed and further advises that small children and pregnant women should not eat any fish containing mercury.
- 45 miles of the South Fork Shenandoah River, North Fork Shenandoah River, and the Shenandoah River are under a fish consumption advisory due to PCB contamination.
- The tidal James River and all tributaries from the fall line at Richmond to the Hampton Roads-Norfolk Bridge Tunnel are under a fish advisory due to the presence of the pesticide Kepone in the sediments.
- A 56 mile fish consumption advisory, based on PCB contamination, was posted in July 1998 in the Roanoke River from Seneca Creek (Route 704 near Long Island) to a pipeline crossing the Roanoke River adjacent to Route 803 in Halifax County and Route 633 in Charlotte County.
- 7 miles of the Blackwater and Nottoway Rivers were under a fish consumption advisory due to dioxin contamination. **This advisory has recently been removed**.

In addition to the information on VDH fish consumption advisories and bans, another evolving aspect of water quality assessment which has potential public health implications, involves fish kills caused by a relatively unknown microorganism *Pfiesteria piscicida.* Additional information concerning this aspect of water quality assessment can be found in Chapter 2.5.

Lake Water Quality Assessment

Virginia has 104 significant (public water supply and/or > 100 acres), publicly owned lakes and reservoirs with an estimated 149,982 total acres. Of these, 140,080 (93.4%) acres were assessed during the reporting period. Of the acres assessed,62,730 acres (44.8%) assessed were fully supporting. 77,342 acres (55.2%) were threatened for at least one designated use. There were no acres impaired. The majority of the threatened waters were related to the recent PCB fish consumption advisory in the Roanoke River. Dissolved oxygen (DO) depletion, possibly associated with excess nutrients, and siltation from nonpoint source influences were also identified as causes for certain lakes being assessed as threatened.

Control of lake pollution is implemented through the following initiatives: the Clean Lakes Program; the application of VDH public water supply and nutrient analysis; the ban on detergents containing phosphorous; and the control of nonpoint source pollutants through Best Management Practices (BMPs).

Chesapeake Bay Program

In 1983, Virginia, Maryland, Pennsylvania, the District of Columbia, EPA and the Chesapeake Bay Commission formally agreed to undertake the restoration and protection of the Bay using a cooperative Chesapeake Bay Program approach and established specific mechanisms for its coordination. Reaffirming and expanding this commitment resulted in a new Bay Agreement signed in 1987. The new agreement contained goals and priority commitments in six areas: living resources; water quality; population growth and development; public information, education and participation; public access; and governance. A bay goal in the area of water quality is to reduce, by the year 2000, the annual load of nitrogen and phosphorus reaching the Bay from controllable sources by 40%.

To achieve the goals of the 1987 Chesapeake Bay Agreement, a basin wide Nutrient Reduction strategy and a basin wide Toxics Reduction strategy were developed. The Chesapeake Bay Office at the Virginia Department of Environmental Quality has developed the following programs to meet the commitments of these two strategies:

Voluntary Nutrient Monitoring Program: This program collects and analyzes nutrient data from major municipal and industrial treatment facilities.

Discharge Monitoring Report Program: Provides reports of nitrogen and phosphorus levels in the effluent of all facilities with nutrient limits or discharging to waters designated as "nutrient enriched".

Special Studies: Collected more detailed data on the particulate nutrient forms being discharged by Bay area treatment facilities.

Phosphate Detergent Ban: The P-Ban, which has been in effect since 1988, prohibits the use, sale, manufacture or distribution of any cleaning agent that contains more than zero percent phosphorus by weight.

Point Source Policy for Nutrient Enriched Waters: This policy was adopted to reduce the discharge of phosphorus into state waters, and in conjunction with the P-Ban, has reduced, by 52%, the Bay's phosphorus levels from 1985 to 1996.

Biological Nutrient Removal: Provides incentives for upgrades of treatment plants to incorporate this advanced treatment process.

Water Quality Standards for Ammonia: Water Control Board adopted stringent water quality standards in 1992 for ammonia nitrogen in fresh and salt water.

Time Variable Model: Developed a 3-D computer model to computer model to provide a simulation of nutrient inputs to the Chesapeake Bay and its tributaries.

Basin Specific Nutrient Reduction Strategies: Strategies to reduces nutrient loads in the Bay's tributaries.

Chlorine Discharge Control: Awards grant money to municipal wastewater treatment facilities to assist in reducing their chlorine discharge to the Bay.

Toxics Loading Inventory: Develops an inventory to estimate the total point and non-point source loadings of toxic substances to the bay.

Water Quality Standards for Toxics: Water quality standards are designed to protect aquatic life, wildlife and human health by designating the use or uses of a waterbody (i.e. fishable, swimmable) and establishing narrative as well as numerical criteria necessary to protect these uses. Forty six numerical standards for toxics and conventional pollutants are designated to protect aquatic life and/or wildlife. Seventy three numerical standards are designated to protect human health via public water supply and fish consumption.

VPDES Permit Program for Toxics: This program evaluates permits to be reissued and new applications with respect to toxic standards.

Toxicity Reduction Evaluation: This process identifies specific chemical or toxicant groups responsible for effluent toxicity, and evaluates and implements treatment alternatives to reduce toxicity to acceptable levels.

Pretreatment Program: The pretreatment program's primary purpose is to protect publicly owned treatment works (POTW'S) and the environment from the adverse impact that can occur when toxic waste are discharged into municipal wastewater systems that are not designed to treat such waste.

Storm Water Management Program: This program has established regulations requiring permit applications for storm water discharges from municipal storm sewers serving a population of 100,000 or more and for storm water discharges associated with industrial activity.

Water Quality and Habitat Monitoring Program: This program assesses trends in water quality and organism abundance throughout Virginia's portion of the Bay and its tributaries.

In addition to these activities, DEQ has been involved in a study of the water quality in the Elizabeth River. Phase I of this study focused on the monitoring of water, sediment and biological quality in the river system. Phase II was initiated in 1990 and was designed to: determine the effectiveness of management actions, identify pollutants of concern in the water column and in sediments, aid in the development of toxic standards, and improve our understanding of the processes that control water and sediment quality. Additional information on the Bay program can be found in Chapter 3.6 of this report.

Wetlands Information

Virginia currently has approximately 1,044,900 acres of wetlands, found mostly in the Coastal Plain province within the state. The majority of these acres are freshwater non-tidal systems. Only about 23% are tidal saltwater. The loss of freshwater wetlands, until the year 1977, had been caused mostly by agricultural conversion; channelization; and pond, lake and reservoir development. Urban development was the primary cause of the loss of estuarine wetlands. Although wetlands trends are known up to the late 1970's, there has been no estimation of additional losses since that time.

Among the wetlands legislation that has been enacted in Virginia over the last twenty years are the Wetlands Act of 1972, which allows local wetlands boards to issue wetlands development permits, and the Chesapeake Bay Preservation Act, which created the Chesapeake Bay Local Assistance Department to oversee the development of Chesapeake Bay Preservation areas by local governments. In 1990, the General Assembly passed legislation to establish the Virginia Water Protection Permit Program.

Ground Water Quality

Ground water programs in Virginia strive to maintain the existing high water quality. The Virginia Ground Water Protection Steering Committee (GWPSC), established in 1986, continues to meet bi-monthly as a vehicle for sharing information, for directing attention to important ground water issues, and for taking the lead on ground water protection initiatives requiring an inter-agency approach. This inter-agency advisory committee is designed to stimulate, strengthen, and coordinate ground water protection activities in the Commonwealth. Ground water protection activities in the Commonwealth are as varied as the funding sources that support them.

Point Source Control Program

Control of Point Sources is managed through the DEQ's Virginia Pollutant Discharge Elimination System (VPDES) Permit Program, Toxics Management Program, and Pretreatment Program. The Virginia Pollutant Abatement Program addresses facilities that handle waste or waste waters, but does not involve discharging to a sewage treatment facility or state waters. These programs have been established to monitor and limit the discharge of conventional and toxic pollutants.

Water quality planning involves the development of Water Quality Management Plans to control both point and nonpoint sources of pollutants to state waters. Water Quality Management Plans include, when necessary, total maximum daily load (TMDL) limitations or strategies to restore water quality.

Nonpoint Source Control Program

DCR has statewide responsibility for coordinating Section 319 nonpoint source (NPS) programs and activities in the state, including development and implementation of the state NPS management program. The strategy used in this program revolves around the use of Best Management Practices (BMP's) for agricultural activities.

Cost/Benefit Programs

Construction Assistance Program. Since 1958, Virginia has received $1.2 Billion in federal appropriations. These federal funds financed up to 75% of the total eligible costs of approximately 183 projects. The state contributed another $52.3 Million with the remainder coming from local sources. Local investment is estimated at approximately $500 Million.

Virginia Revolving Loan Fund. In 1986, Virginia created the Virginia Water Facilities Loan Fund to provide low cost loans to local governments for wastewater treatment improvements. From 1988 to 1995, Virginia has received $301,748,178 in federal capitalization grants. In addition, the General Assembly has appropriated $61,406,546.

Funds through Virginia's loan program have eliminated 12 primary dischargers, upgraded or replaced 22 inadequate lagoons, upgraded 70 outdated treatment facilities, improved water quality at 27 locations by reducing infiltration and inflow, addressed 18 potential health hazard situations by eliminating raw sewage discharges and failing septic systems and provided design grants for the elimination of 2 remaining municipal primary wastewater treatment facilities.

Surface Water Quality Monitoring Programs

The Ambient Water Quality Monitoring Program included 1,620 monitoring stations during this assessment period. Of these stations, 1349 stations are sampled for chemical and physical parameters on a variable basis to determine water quality conditions. The remaining 271 stations were used for biological monitoring. Approximately 39,000 samples were collected to perform a multitude of various analyses. A "special study" subset of monitoring stations form the Fish Tissue and Sediment Characterization Monitoring Program. These stations are sampled for pesticides, metals and organics in fish tissue and sediment on a three year revolving cycle. These stations include some previously established ambient and biological water quality stations along with separate, independent stations . Each biological station sampled during the cycle was sampled to determine the health of the bottom dwelling invertebrate population and the ability of streams to support a balanced aquatic community. Fish tissue monitoring stations are sampled and used as a health screening analysis for any potential fish consumption problems.

Summary

In summary, the water quality information made available to DEQ from the programs described above are used to assess the success and effectiveness of the water quality control program as well as the quality of the waters within the Commonwealth. The goal of the water quality control program is to assess all surface waters and attain water quality to support all designated uses of the waters in the Commonwealth.